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Research Paper

The Effect of a Training Program Based on Developing Motor Memory in Developing Special Physical Abilities and Improving the Long Jump Performance of The Junior National Team of Kirkuk Governorate

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ABSTRACT

This research aims to identify the effect of a training program based on developing motor memory on developing specific physical abilities, such as explosive power, balance, agility, and transition speed, and improving the long jump performance of junior players from the Kirkuk Governorate national team. The researcher used the experimental approach, designing two groups (experimental and control) using a pre- and post-test method, to suit the nature and subject of the research. The research sample consisted of 17 players from the Kirkuk national athletics team (long jump). Their ages ranged between 14 and 16 years. They were randomly divided into two equal groups: an experimental group (6 players) who implemented a training program based on developing motor memory for 8 weeks, with 3 training sessions per week. A control group (6 players) continued with the traditional training program approved by the coaches. The proposed training program included specific exercises to develop motor memory through organized and varied repetitions, to enhance neuromuscular connectivity and motor retention, with a direct focus on the physical abilities specific to the long jump: explosive power, agility, transition speed, and balance. A set of field tests was used to measure these variables, in addition to measuring long jump achievement. The problem of the research lies in the researcher's observation of weak motor performance and achievement levels in the long jump. This is due to the current training programs relying on traditional methods that neglect mental and sensory-motor aspects, such as motor memory, which may limit the development of performance. Therefore, the experimental approach was used, and a sample of juniors from the Kirkuk Governorate national team was selected. The results showed statistically significant differences in favor of the post-tests in all specific physical abilities and long jump achievement. The researcher concluded that the introduction of training based on developing motor memory contributes effectively to the development of specific physical abilities and improving long jump achievement. He also concluded that relying on organized repetition and varied motor practices helps enhance motor retention and neuromuscular connectivity in juniors. The researcher recommends adopting the proposed training program to prepare junior track and field athletes, particularly in the long jump. He also recommends incorporating mental training and motor memory strategies into other track and field events and various sports.

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KEYWORDS: Motor memory, long jump, physical abilities, sports training.

1. INTRODUCTION

The long jump is a fundamental athletics event that relies on the integration of multiple elements of physical abilities, motor skills, and time accuracy. Effective performance in this event is a direct result of an athlete's ability to coordinate a series of complex movements in a short period of time, requiring meticulous training that goes beyond traditional physical aspects to include mental and cognitive aspects. In this context, motor memory emerges as a vital concept in developing athletic performance, as it contributes to consolidating movement patterns in the central nervous system, helping athletes perform motor skills with precision, speed, and stability. However, the training reality for the Kirkuk Governorate youth team still relies mostly on traditional methods that neglect this vital cognitive aspect. Through his academic work and field training, the researcher observed a clear deficiency in the level of long jump performance of the junior national team in Kirkuk Governorate. This prompted him to explore modern training methods, such as the use of motor memory, to address this deficiency and improve performance (Abdul Zahra, Khaled Kazim, 2022, pp. 61-65).
Significance of the Research:
The importance of the research topic itself:

1. It integrates the motor and cognitive aspects (motor memory), a modern approach in sports training, and is directly related to improving performance in field events such as the long jump.
2. Innovation in the training approach, as the research presents a training program based on neurocognitive foundations, rather than solely physical ones, which adds scientific and methodological value to the field of modern sports training.
3. Bridging the scientific and applied gap in sports training in Kirkuk Governorate, particularly in Iraq, where training programs still rely on mechanical repetition without exploiting the capabilities of the cognitive nervous system. 4- Achieving direct practical benefits, as the research results can be utilized in developing training and practical curricula for competitors, improving the quality of performance in competitions and tournaments.
4. Serving the field of athletics by improving the level of achievement in the long jump event, an event that relies heavily on the harmony of physical abilities and motor control (Youssef, Muhammad Abd al-Sattar, 2021, 87-89) (Schmidt & Lee, 87-89).

Research Problem

The long jump event is an event that relies heavily on the integration of physical abilities and fine motor skills, such as explosive power, agility, transitional speed, balance, and neuromuscular coordination. Although training programs in sports clubs often focus on developing physical aspects, the cognitive-motor aspect, particularly motor memory, is also underrepresented. It does not receive sufficient attention in these training programs. This deficiency is a reason for limiting the development of specific physical abilities and achieving optimal performance in the long jump event.

Through the researcher's observation of the training situation of young long jumpers in Kirkuk Governorate, it became clear that there is a clear weakness in the level of achievement and performance in the long jump event, in addition to a decline in some of the specific physical abilities associated with this event. This indicates the limited effectiveness of the traditional programs adopted. Hence, the need to design a training program based on developing motor memory, given its effective role in developing specific physical abilities and improving motor performance and athletic achievement.
The research problem is defined in the following question: What is the effect of a training program based on developing motor memory in developing specific physical abilities and improving performance in the long jump event for young players from Kirkuk Governorate?

2. RESEARCH OBJECTIVES

1. Design a training program based on developing motor memory that is consistent with the requirements of the long jump event for young players from Kirkuk Governorate.
2. To identify the impact of the training program on developing specific physical abilities, such as explosive power, agility, transitional speed, and balance, among the sample members.
3. To measure the impact of the program on improving the level of achievement in the long jump event for juniors from the Kirkuk Governorate national team.
4. To compare the results of the experimental and control groups after implementing the program, to measure the effectiveness of training based on developing motor memory.

Research Areas

- Human Area: Juniors from the Kirkuk Governorate national team for the year 2024-2025.
- Time Area: The training program was implemented for (8) weeks, from October 10, 2024 to December 10, 2024.
- Spatial Area: Private playing fields and halls at the Northern Gas Club in Kirkuk.

3. RESEARCH METHODOLOGY

Given the nature of the problem and the research objectives, the researcher used the experimental approach, designing two equivalent groups (experimental and control) with pre- and post-tests. This is the most appropriate approach for studying the effect of the independent variable (the training program based on developing motor memory) on the dependent variable (special physical abilities and achievement in the long jump). This design is considered one of the most accurate designs for measuring differences between the two groups, as it helps control internal variables and allows for objective comparison between the pre- and post-tests (Obeidat *et al.,* 2021, pp. 213-215).

Research Population and Sample:
The research population consisted of (17) juniors from the Kirkuk Governorate national team in the long jump event for the year 2014-2015, within the age group of (14-16) years. The population was deliberately selected as it directly represents the target group and aligns with the research objectives. (3) juniors from the original community were used for the exploratory experiment. The primary research sample was randomly selected and divided, comprising (12) juniors with similar levels of basic physical abilities and previous experience in the long jump. They were randomly divided into two equal groups as follows:

1. The experimental group (6) juniors implemented a training program based on developing motor memory.
2. The control group (6) juniors continued to follow the traditional training program approved by the coaches.
3. Equivalence was achieved between the two samples on some basic variables (height, weight, and physical tests related to the long jump) to ensure the neutrality of the results.

Data Collection Methods:
The researcher relied on the following methods to collect information and data for the study:

1. **Theoretical and practical sources:** books, university dissertations, scientific research, and specialized articles in the field of sports training, motor memory, and the long jump.
2. **Questionnaire:** The questionnaire was prepared to survey experts' opinions on designing a training program based on developing motor memory.
3. **Specific Physical Tests:** The researcher used a set of standardized and approved tests to measure specific physical abilities associated with long jump effectiveness, including:

- Explosive power test (vertical jump from standing or broad jump from standing).
- Dynamic balance test.
- Agility test (such as the slalom running test).
- Transitional speed test (30m flying start test).
- Long jump achievement test (measured in meters).

4. **Field observation:** The researcher monitored the performance of the sample members during the training program to record observations and variables throughout the training phases.
5. **Recordings and visual documentation**:

- A smartphone or camera was used to document motor performance during tests and training for technical analysis when necessary.

Research Procedures

1. Obtaining Official Approvals:
Approval of the Scientific Department (Department of Physical Education and Sports Sciences at the College) for the research plan.
Approval of the College Council or the Graduate Studies Committee is required for conducting the research.
Approval of the Iraqi Athletics Federation, Kirkuk Branch, and the team's coaches and administrators to conduct the experiment on the national team's juniors. Since the participants are aged (14-16) years, they are legally minors. Parental consent must be obtained after explaining the research objectives and the nature of the exercises.

2. Sample Selection:
The Kirkuk Governorate national team's juniors in the long jump event, numbering 17 juniors, were divided into two random groups:

- An experimental group of (6) juniors
- A control group of (6) juniors.

Implementing the pilot:
Pilot: The researcher used (3) participants from the same research community, but outside the main application sample, for:
- Verifying the validity of the equipment and tools used.
- Testing the effectiveness of the training program in the field.
- Determining the time required to implement the training modules.
(2) players were also excluded from the original sample for several reasons, including:
Injury during the preparation period (one player).
Repeated absence from training sessions (one player).
Thus, the final number of participants in the primary sample was (12) players, distributed equally into two groups.

Pre-tests:
Special physical tests and achievement tests in the long jump were conducted for both groups, according to the approved conditions and standards to ensure the reliability and validity of the results.

Implementation of the Training Program:
The experimental group underwent a training program designed to develop motor memory from October 10, 2024 to December 10, 2024. The program lasted for eight weeks, with a total of (24) training units, at a rate of three training units per week, and a training unit duration of (90) minutes. The control group continued its regular training.

Post-tests:
The same tests administered before were administered after the program was completed, under the same conditions and procedures to ensure accurate comparison.

Data Collection and Statistical Analysis:
The results of the pre- and post-tests were entered into a computer using the SPSS statistical program (for two correlated and independent samples, t-test), using appropriate tests.

4. RESULTS AND DISCUSSIONS

Table 1: Presentation, analysis, and discussion of the results of the pre- and post-tests of the experimental group. The results of the differences between the pre- and post-tests of the experimental group members were presented using the (T) test for two related samples

Variable	Units	Experimental pre-average	Experimental posttest average	Calculated T value	Table (T) value (df=5)	Statistical significance level (Sig)	Statistical function
Explosive Power	meter	2.32	2.66	4.78	2.57	0.001	Statistically significant
Agility	second	12.8	11.2	3.59	2.57	0.001	Statistically significant
Transitional Speed	second	4.56	4.10	5.12	2.57	0.001	Statistically significant
Dynamic Balance	centimeter	17.2	20.5	3.96	2.57	0.001	Statistically significant
Long Jump Achievement	meter	4.51	5.59	5.11	2.57	0.001	Statistically significant

To calculate the T-table, you must determine the significance level (a): usually 0.05 or 0.01. You must also determine the degrees of freedom (df). For a two-sample t-test, the degree of freedom is: df = n-1 - 6 = 1 = 5. The T-table at a significance level of 0.05 = 2.57 and the degree of freedom is df = 5. Refer to the T-table or use statistical software to obtain the corresponding T-table value for a and df. Comparing the calculated T with the tabulated T: If the calculated T is ≥ the tabulated T, the difference is statistically significant. If the calculated T is ≥ the tabulated T, the difference is neither statistically significant nor significant.

5. ANALYSIS AND DISCUSSION OF RESULTS

The results in Table 1 showed statistically significant differences between the pre- and post-tests in favor of the post-test in all specific physical variables. This demonstrates the effectiveness of the training program based on developing motor memory in improving all specific physical abilities and achieving significant progress in the long jump. This is due to the program's reliance on structured exercises based on motor repetition linked to mental visualization, which contributes to improving the mechanism of movement execution and stabilization in the neuromuscular system, as indicated by Schmidt & Lee (2020, 123).

Agility: A significant improvement in agility was evident between the pre- and post-tests. This is attributed to the introduction of compound exercises (zigzag running, hurdles, and repeated jumping), which helped increase the ability to change direction quickly and maintain motor balance, which positively impacted long jump performance (Miller, M.G., *et al.,* 2006, 459-465).

Studies by Sheppard & Young (2006) and Paul & Gabbett (2010) confirmed that agility exercises such as zigzag running and hurdles improve the ability to change direction and maintain motor balance. (Mero *et al.,* 1992) and (Rosset *et al.,* 2001) also demonstrated that gradual training intensity and the use of short sprints enhance the neuromuscular response, which positively impacts transition speed. (Sheppard, J. M., & Young, W. B., 2006, 919-932), (Paul, D. J., & Gabbett, T. J., 2022, 757-770) ,(Ross, A., Leveritt, M., & Riek, S., 2001, 409-425), (Mero *et al.,* 1992, 376-392).

Transitional speed: The post-test results showed significant differences in favor of the post-test. This was due to the gradual increase in training intensity (60%-85%), along with the use of short, gradual running exercises, which enhanced the neuromuscular response and, consequently, improved transitional speed, which is one of the key variables for successful approach and takeoff in the long jump (Slimani, M., *et al.,* 2016, 231-247).

Table 2: Presentation, analysis, and discussion of the results of the pre- and post-tests of the control group: The differences between the pre- and post-tests of the control group members were presented using the (T) test for two correlated samples

Variable	Units	Control pre-average	Control posttest average	Calculated T value	Table (T) value (df=5)	Statistical significance level (Sig)	Statistical function
Explosive Power	meter	2.28	2.34	1.02	2.57	0.324	Not significant
Agility	second	12.9	.127	0.95	2.57	0.367	Not significant
Transitional Speed	second	.455	4.54	.083	2.57	0.401	Not significant
Dynamic Balance	centimeter	16.9	17.1	0.88	2.57	0.398	Not significant
Long Jump Achievement	meter	4.51	4.59	1.11	2.57	0.275	Not significant

To calculate the T-table, you must determine the significance level (a): usually 0.05 or 0.01. You must also determine the degrees of freedom (df). For a two-sample t-test, the degree of freedom is: df = n-1 - 6 = 1 = 5.

The T-table at a significance level of 0.05 = 2.57 and the degree of freedom is df = 5. Refer to the T-table or use statistical software to obtain the corresponding

T-table value for a and df. Comparing the calculated T with the tabulated T: If the calculated T is ≥ the tabulated T, the difference is statistically significant. If the calculated T is ≥ the tabulated T, the difference is neither statistically significant nor significant.

Analysis and Discussion of Results:

Table (2) shows that the results for all studied variables (explosive power, agility, transition speed, balance, and long jump performance) were not statistically significant at a significance level of 0.05. This is attributed to the fact that the calculated T-value did not show significant differences between the pre- and post-tests, as the control group did not undergo the proposed training program but was limited to traditional, conventional training. This made the changes that appeared slight and insufficient to produce statistically significant differences.

Comparison between the results of the two independent groups (experimental and control) in the post-tests

Table 3: Comparison between the arithmetic means of the two independent groups after the training program

Variable	Units	Experimental posttest average	Control posttest average	Calculated T value	Table (T) value (df=10)	Statistical significance level (Sig)	Statistical function
Explosive Power	meter	2.66	2.34	3.75	2.23	0.001	Statistically significant
Agility	second	11.2	12.8	4.02	2.23	0.001	Statistically significant
Transitional Speed	second	4.10	4.54	3.89	2.23	0.001	Statistically significant
Dynamic Balance	centimeter	20.5	17.1	4.11	2.23	0.001	Statistically significant
Long Jump Achievement	meter	5.59	4.59	4.25	2.23	0.001	Statistically significant

To calculate a T-table, you must determine the significance level (a): usually 0.05 or 0.01. You must also determine the degree of freedom (df). For a two-sample T-test, you must compare the results of the two independent experimental and control groups. Calculated based on the degree of freedom: df = n1 + n2 – 2 = 6 + 6 – 2 = 10. For a two-sample T-test, the degree of freedom is: df = n1 + n2 – 2 = 6 + 6 – 2 = 10. The T-table is calculated at a significance level of a = 0.05 = 2.57 and the degree of freedom is df = 10. Refer to the T-table or use statistical software to obtain the corresponding T-table value for a and df. Comparing the calculated T-test with the tabulated T-test: If the calculated T-test is ≥ the tabulated T-test, then the difference is statistically significant. If the calculated T is > from the tabular T, then the difference is not statistically significant.

Analysis and Discussion of the Results (Comparison between the Experimental and Control Groups):

Table (3) shows that there are significant differences in favor of the experimental group in the variables (explosive power, agility, transitional speed, balance, and long jump performance) that are statistically significant at a significance level of (0.05). This is attributed to the effectiveness of the training program and the calculated T value, confirming that the training program, where the values were based on developing motor memory, included complex exercises (for agility and balance), explosive power exercises (plyometrics), and gradual speed exercises (for transitional speed). This result confirms the clear superiority of the experimental group in achieving the long jump, which contributed to a significant improvement in the students' performance. This is what Schmidt & Lee (2020) indicated, indicating that motor memory plays a vital role in stabilizing complex movements through repetition of performance and enhancing neuromuscular communication. (Schmidt & Lee, 2020, 123)

6. CONCLUSIONS

1. The training program based on developing motor memory proved effective in developing specific physical abilities (such as explosive power, balance, long jump performance, agility, and transition speed) for the junior national team of Kirkuk Governorate.
2. The use of training methods related to mental imagery and motor repetition contributed to improving motor performance and increasing the ability to recall complex movements associated with the effectiveness of the long jump.
3. The experimental group demonstrated a significant superiority in the post-achievement test in the long jump compared to the control group, indicating a direct positive effect of the training program on competitive performance.
4. The results confirm that combining physical training with mental stimulation through motor memory contributes to accelerating skill learning and consolidating them more effectively among the junior national team of Kirkuk Governorate. 5. The study results confirm the importance of adopting modern training programs based on scientific foundations in motor control and learning, especially in individual sports such as track and field events.

Recommendations:

1. Adopting training programs based on developing motor memory as part of the field training curricula for the junior team of Kirkuk Governorate, given its effective role in developing physical and skill performance.
2. The necessity of integrating mental exercises (motor visualization) with practical exercises, especially in track and field events, to enhance motor learning and improve achievement.
3. Directing coaches to design training that takes into account the stages of motor learning and employing stimulating educational methods that enhance skill consolidation in juniors and other age groups.
4. Encouraging researchers to conduct future studies on the impact of similar programs in other sporting events (such as running, throwing, high jump, etc.) to verify the effectiveness of motor memory in various disciplines.
5. Introducing the concepts of motor learning and motor memory into theoretical and practical curricula, to develop the scientific knowledge of students and trainers in the applied field.

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